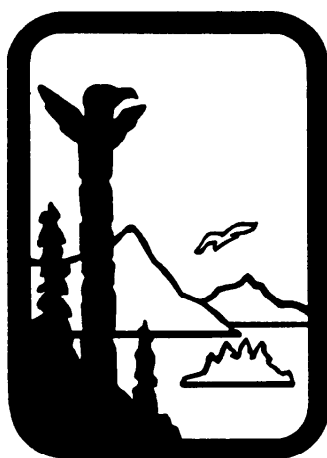


# **Alaska's SLAMS/NAMS Monitoring Network Assessment 2001 Annual Report**



**State of Alaska Department of Environmental Conservation**

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## **Attachments**

### Site Descriptions

- Municipality of Anchorage
- Fairbanks North Star Borough
- City and Borough of Juneau
- Matanuska Susitna Borough
- Ketchikan Gateway Borough
- Denali National Park and Preserve

## 1. Introduction

The State of Alaska has a longstanding program of monitoring air quality. Alaska is a huge state with a small population. It is not possible to monitor the air in every community so the Department of Environmental Conservation has taken a three-pronged approach to monitoring network design:

1. Monitoring larger communities to cover the largest possible population exposure.
2. Monitoring designated smaller towns that are representative of multiple communities in a region. Generally this monitoring is done with SPMS.
3. Monitoring is response to complaints. This is performed using SPMS.

The largest population centers in Alaska are Anchorage, Fairbanks, and Juneau (260,000, 84,000 and 30,000 people respectively). There are no other communities with populations over 10,000. There are several towns with populations between 1,000 and 10,000, and there are many towns smaller than 1,000 people (in many cases much smaller). Figure 1 is a map of Alaska.



Figure 1 – Map of Alaska. The majority of the Aleutian islands (west) have been cut off.

## Geography

Alaska comprises one sixth of the United State's landmass, spanning 20 degrees of latitude (51°N – 71°N). Alaska contains 65% of the U.S. continental shelf, more shoreline than the rest of the 49 states combined, 17,000 square mile of glaciers, 3,000,000 lakes over 20 acres in size, and receives 40 % of the U.S. fresh water runoff. Figure 2 is a map of Alaska superimposed over a map of the contiguous 48 states.

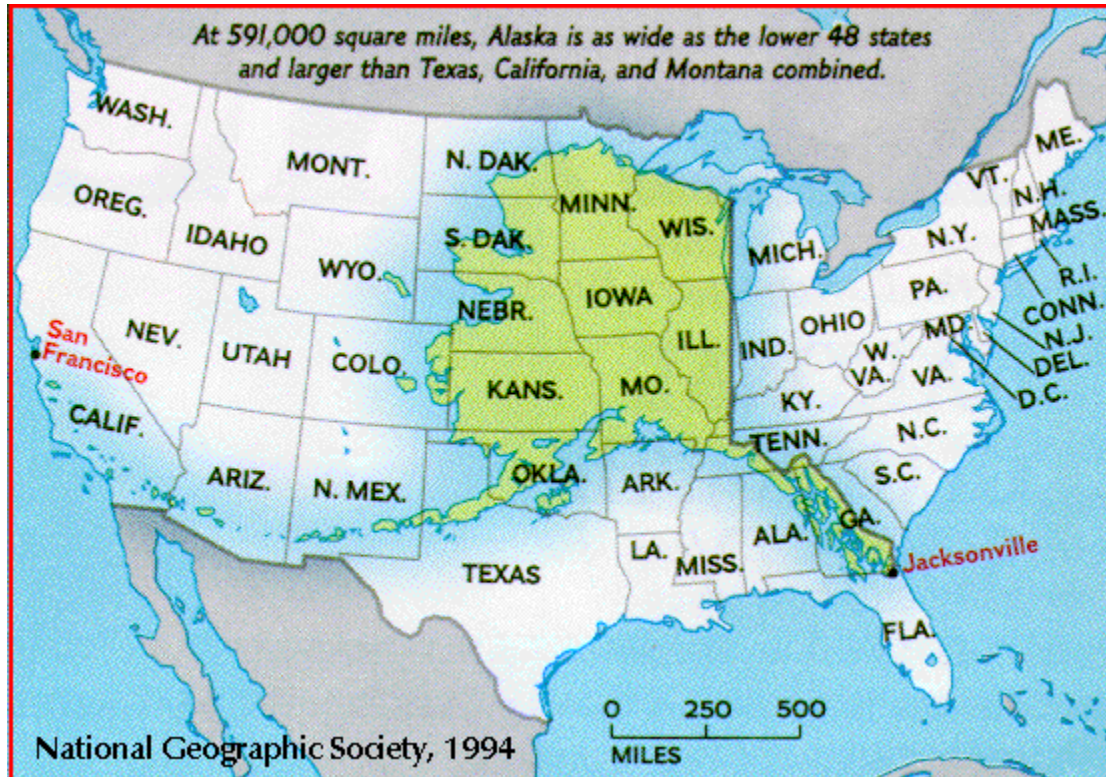


Figure 2 – A map of Alaska superimposed over the contiguous 48 U. S. states.

The **Panhandle** is a temperate rain forest in the southeastern part of Alaska that is mainly comprised of mountainous islands and protected marine waterways. Rainfall exceeds 100 inches per year in many areas. Most communities are small and contain less than 5,000 people. The State's capital, Juneau, is the largest city in the region with a population of approximately 30,000.

The **South Gulf Coast** is one of the rainiest regions in the world and is covered with rugged mountains and barren shoreline. The target of many Gulf of Alaska storms, this coastline only contains a handful of small fishing communities.

**Southcentral Alaska** is fairly temperate in comparison to the rest of Alaska. Rainfall varies widely across the region, averaging between 15 inches a year in the Matanuska-Susitna (Mat-Su) Valley and 60 inches per year in Seward. This region contains 60-70% of the state's population with Anchorage, the state's largest city, containing over 250,000 people. Bounded by active volcanoes on the southwest and glacial river plains to the northeast, this sector of the state has experienced 24-hour dust levels in excess of 1,000  $\mu\text{g}/\text{m}^3$ .

The **Alaska Peninsula** and its westward extension, the **Aleutian Chain** form the southwestern extension of the mountainous Aleutian Range. This region is comprised of remote islands and small, isolated fishing villages. This area is one of the world's most economically important fishing areas, as well as a vital migratory route and nesting destination for birds.

**Southwest Alaska** encompasses the vast Yukon-Kuskokwim River Delta, a wide low-lying area formed by two of the state's major river systems and dotted with hundreds of small lakes and streams. This region is heavily impacted by storm systems which rotate northward into the Bering Sea. Communities in this region receive between 40 and 70 inches of precipitation a year. This portion of the state is quite windy, experiencing winds between 15 – 25 miles per hour throughout the year. These winds, coupled with fine delta silt, help to create dust problems for some southwestern communities. Rural villages normally contain fewer than 500 people and are located along the major rivers and coastline. Regional hubs such as Galena and Bethel are few and may contain up to 8,000 residents.

**Interior Alaska** describes the vast expanse of land north of the Alaska Range and south of the Brooks Range. This region contains Fairbanks, Alaska's second largest city, with a population of 32,000 people (84,000 in the borough). The climate varies greatly with clear, windless, -50°F winter weather giving way to summer days with 90°F temperatures and afternoon thunderstorms. Sectors of this region also experience high winds and high concentrations of re-entrained particulates from open riverbeds.

The **Seward Peninsula** is the section of Alaska which extends westward into the Bering Sea between Norton Sound and Kotzebue Sound. This hilly region is barren and windswept with 15-25 mile per hour winds common. Rainfall in this region averages between 15 and 24 inches per year. Villages in this region are small except for Nome which has over 3,000 people.

The **North Slope** region, located north of the Brooks Range, is an arctic desert receiving less than ten inches of precipitation annually. Wind flow is bimodal, with the easterlies dominating the meteorological patterns. Winter wind speeds average 15-25 mile per hour dropping off slightly during the summer. The North Slope is extremely flat and supports huge summertime populations of bears, caribou, and migratory birds. There are very few communities besides Point Barrow and Deadhorse/Prudhoe Bay in this region.

### **Topography**

Alaska is topographically varied. The state contains seven major mountain ranges whose features influence a majority of all regional flow patterns. The mountains channel flow, create rotor winds, cause up slope and down slope flow, initiate drainage winds, produce wind shear and extreme mechanical turbulence. For air quality impact analyses, Alaska's rugged mountains can only be described as complex, complex terrain making most air quality models unsuited for use in the state. The complexity of most local meteorology renders the use of site specific met data inadequate for control strategy development.

**Economy**

The Alaskan economy is centered on the oil industry, the mining industry, commercial fishing, logging and tourism. Of the five, only the oil and mining industries provide a year-round source of income to the state and require the full time operation of stationary, power generation equipment. The mining industry is scattered across the state with a zinc mine near Kotzebue, a coal mine at Healy, a silver mine near Juneau, and major gold mine north of Fairbanks. Numerous smaller mining ventures exist across the state.

The state's oil industry operates production wells in Cook Inlet and on the North Slope. North Slope oil is pumped 800 miles through the Trans-Alaska Pipeline System (TAPS) to Valdez for shipment to refineries in the lower 48 states. The TAPS has several pump stations to maintain the flow of oil in the pipeline. The majority of new oil exploration work is being conducted on the North Slope. Three in-state refineries, Mapco (North Pole) and Petro Star (Valdez and North Pole) process small amounts of North Slope crude. Cook Inlet crude is processed at the Tesoro refinery in Nikiski, located near Kenai, Alaska.

In addition to oil, the Unocal Chemical Plant in Nikiski converts Cook Inlet natural gas into fertilizer.



## 2. OVERVIEW OF SLAMS/NAMS MONITORING NETWORK

### SLAMS/NAMS Monitors

The State of Alaska monitoring network has five SLAMS sites for carbon monoxide, two SLAMS sites for PM<sub>10</sub>, and seven SLAMS sites for PM<sub>2.5</sub>. There are no current NAMS-designated monitors in the monitoring network. SLAMS (*and SPMS*) sites are located in communities as follows:

#### Carbon Monoxide:

Municipality of Anchorage	2 SLAMS (2 SPMS)
Fairbanks North Star Borough	3 SLAMS

#### PM<sub>10</sub>:

Municipality of Anchorage	1 SLAMS (3 SPMS)
City and Borough of Juneau	1 SLAMS
Matanuska-Susitna Valley	1 SPMS

#### PM<sub>2.5</sub>:

Municipality of Anchorage	2 SLAMS
Fairbanks North Star Borough	1 SLAMS
City and Borough of Juneau	1 SLAMS (1 SPMS)
Matanuska-Susitna Valley	2 SLAMS
(Ketchikan	1 SPMS)
Denali National Park	1 SLAMS

A specific description of each site is given as an attachment and includes information on siting, purpose of monitoring, equipment installed, sampling frequency, and site designations.

### Carbon Monoxide

Carbon monoxide (CO) is monitored in winter months (October through March) in Anchorage and Fairbanks. Both these cities are classified as serious non-attainment for CO.

In Anchorage there are two SLAMS sites, both microscale. There are also one microscale and one neighborhood scale SPMS for a total of four monitoring sites.

The SLAMS sites are Benson and Spenard, and Garden. The Benson and Spenard site is located near a very busy intersection. The Garden site is located in a residential neighborhood.

The neighborhood scale SPMS is called Turnagain, and was the location with the highest CO concentrations during a saturation study in 1997-1998. The microscale SPMS is called Benson and Seward, and it is near the Benson and Spenard site but located at a busier intersection (and measuring higher concentrations).

Fairbanks has three SLAMS sites: one microscale street canyon site called Old Post Office, a microscale traffic corridor site called State Office Building, and a neighborhood scale site called Hunter Elementary School.



**PM<sub>10</sub>**

There are only two PM<sub>10</sub> SLAMS sites operating in Alaska. One in Juneau in the Mendenhall Valley nonattainment area (Floyd Dryden site), and one in Eagle River (a satellite community of Anchorage) at the Parkgate site which is also a nonattainment area.

There are numerous PM<sub>10</sub> SPMS in Alaska including 3 in Anchorage and 1 in the Matanuska-Susitna Borough near Butte. The Harrison Court site near Butte is operated year round but serves to assess the wind-blown dust events that occur occasionally in the spring and fall.

**PM<sub>2.5</sub>**

There are nine PM<sub>2.5</sub> monitoring sites in Alaska. Seven of the nine are SLAMS sites, and the other two are SPMS. The SLAMS sites include a background site and a transport site, but are otherwise entirely population oriented (or CORE- community oriented). The SLAMS sites are allocated thus:

Anchorage (2)	middle scale and microscale, both CORE
Fairbanks (1)	neighborhood scale, CORE
Juneau (1)	neighborhood scale, CORE
Matanuska-Susitna (2)	both urban scale, one transport and one CORE
Denali Park (1)	regional scale, background

There is an SPMS in Juneau as well. It is neighborhood scale and population oriented. There is also an SPMS in Ketchikan (neighborhood scale, CORE) that has operated seasonally for two winters. Both sites are intended for relocation in the near future.

## 5. SITE SUMMARIES

### Anchorage Sites

#### Benson & Spenard [AIRS ID 02-020-0017]

This is an Anchorage CO monitoring site. This site is operated seasonally for CO. During the late 1980s, this site measured the highest CO concentrations in Anchorage. The site is equipped with monitors as follows:

- CO (SLAMS) – A single Thermo-Environmental Instruments 48C CO monitor.

#### Garden Site [AIRS ID 02-020-0018]

This is a historical CO site that was also selected as one of two sites for monitoring PM<sub>2.5</sub>. It is also used as a special purpose monitoring (SPM) location for PM<sub>10</sub>. The site is equipped with monitors as follows:

- PM<sub>2.5</sub> (SLAMS) – Three Rupprecht and Pattashnick (R & P) Partisol 2000 samplers. This site operates on an every third day schedule. These samplers operate in a collocated configuration.
- PM<sub>10</sub> (SPMS) – One General Metal Works high-volume sampler.
- PM<sub>10</sub> (SPMS) – A single Anderson beta-attenuation monitor has been installed to provide information in real time for evaluating the Air Quality Index.
- CO (SLAMS) – A single Thermo-Environmental Instruments 48C CO monitor operates seasonally with an inlet approximately 3 meters above the ground.
- CO (SPMS) – A single Thermo-Environmental Instruments 48C CO monitor operates with its inlet directly above that of the SLAMS monitor at a height of approximately 10 meters.

#### Seward Highway [AIRS ID 02-020-0037]

This is an Anchorage CO monitoring site. This site is operated seasonally for CO. This site measured the highest CO concentrations in the mid-1990s. The site is equipped with monitors as follows:

- CO (SLAMS) – A single Thermo-Environmental Instruments 48C CO monitor.

#### Muldoon [AIRS ID 02-020-0043]

This is an Anchorage PM<sub>10</sub> monitoring site. The site operates seasonally and is equipped with monitors as follows:

- PM<sub>10</sub> (SPMS) – Two General Metal Works high-volume samplers.

#### Tudor Road [AIRS ID 02-020-0044]

This site used to be known as Allstate, and was the second chosen for PM<sub>2.5</sub> monitoring. There are also high-volume samplers and a beta-attenuation PM<sub>10</sub> monitor at the site.

- PM<sub>2.5</sub> (SLAMS) – Two R & P Partisol 2000 samplers.
- PM<sub>10</sub> (SPMS) – Four General Metal Works high-volume samplers.
- PM<sub>10</sub> (SPMS) – A single Anderson beta-attenuation monitor.

#### Turnagain [AIRS ID 02-020-0048]

This is an Anchorage CO monitoring site. This site is operated seasonally for CO, and was started in the fall of 1998. It was selected based on results from the Municipality of Anchorage (MOA) 1997-1998 CO saturation study. The study indicated that this site represented the highest CO concentrations in Anchorage. The site is equipped with monitors as follows:

- CO (SPMS) – A single Thermo-Environmental Instruments 48C CO monitor.

#### Parkgate, Eagle River [AIRS ID 02-020-1004]

This is a PM<sub>10</sub> monitoring site located in Eagle River. Eagle River is a community outside of the city of Anchorage, but within the Municipality. The site is equipped with monitors as follows:

- PM<sub>10</sub> (SLAMS) – One General Metal Works high-volume sampler.
- PM<sub>10</sub> (SPMS) – A single Anderson beta-attenuation monitor.

### **Fairbanks Sites**

#### State Office Building [AIRS IDs 02-090-0010 and 02-090-0013]

This location serves for PM<sub>2.5</sub> and CO monitoring. The two separate AIRS IDs represent the particulate matter and CO samplers respectively. The locations of the inlets on the building are separated by a large distance. This site is operated seasonally for CO. The site is equipped with monitors as follows:

- PM<sub>2.5</sub> (SLAMS) – Three R & P Partisol 2000 samplers. This site is operated in a collocated configuration.
- CO (SLAMS) – A single Monitor Labs model 8830.

#### Old Post Office [AIRS ID 02-090-0002]

This is a CO monitoring site in Fairbanks. This site is operated seasonally for CO. The site is equipped with monitors as follows:

- CO (SLAMS) – A single Dasibi model 3008.

### Hunter Elementary School [AIRS ID 02-090-0020]

This is a CO monitoring site in Fairbanks. This site is operated seasonally for CO. The site is equipped with monitors as follows:

- CO (SLAMS) – A single Monitor Labs model 8830.

### **Juneau Sites**

#### Floyd Dryden Middle School [AIRS ID 02-110-0004]

The Floyd Dryden site is a neighborhood scale SLAMS located at Floyd Dryden Middle School. The site is equipped with monitors as follows:

- PM<sub>2.5</sub> (SLAMS) – Three Rupprecht and Pattashnick (R & P) Partisol 2000 samplers. This site operates on an every third day schedule. These samplers operate in a collocated configuration.
- PM<sub>10</sub> (SLAMS) – Three General Metal Works high-volume samplers.
- PM<sub>10</sub> (SPM) – A single nephelometer is operated to provide information for calling air quality alerts during the woodsmoke season, November through February.

#### Lemon Creek Valley [AIRS ID 02-110-0026]

The Lemon Creek site is a neighborhood scale SPMS. The site is equipped with monitors as follows:

- PM<sub>2.5</sub> (SPMS) – Two R & P Partisol 2000 samplers.

### **Matanuska-Susitna Sites**

#### Big Lake Elementary School [AIRS ID 02-170-0004]

This is the SLAMS transport site for Alaska for PM<sub>2.5</sub>. The site is equipped with monitors as follows:

- PM<sub>2.5</sub> (SLAMS) – Two R & P Partisol 2000 samplers.

#### Butte [AIRS ID 02-170-0008]

This site is also referred to as Harrison Court, and was formerly located at the Pioneer Peak Baptist Church (approximately one quarter mile to the north). The site is equipped with monitors as follows:

- PM<sub>2.5</sub> (SLAMS) – Two R & P Partisol 2000 samplers.
- PM<sub>10</sub> (SPMS) – Two General Metal Works high-volume samplers.
- PM<sub>10</sub> (SPMS) – A single Anderson beta-attenuation monitor.

## **Denali National Park Site**

### Park Headquarters [AIRS ID 02-290-0003]

This is the SLAMS background site for Alaska for PM<sub>2.5</sub>. This site is located very close to the National Park Service IMPROVE protocol site, and has the secondary purpose of providing a comparison with the visibility monitoring sampler. The site is equipped with monitors as follows:

- PM<sub>2.5</sub> (SLAMS) – Two R & P Partisol 2000 samplers.

## **Ketchikan Site**

### Bear Valley [AIRS ID 02-130-0008]

This is a SPMS site for a residential area of Ketchikan for PM<sub>2.5</sub>. This site is operated seasonally. The site is equipped with monitors as follows:

- PM<sub>2.5</sub> (SPMS) – Two R & P Partisol 2000 samplers.

## **Monitoring in Rural Alaska**

Summer season fugitive dust in rural Alaskan communities has led to several complaints. Virtually all rural roads are unpaved. Once break-up occurs, large dust clouds are generated by off-road vehicles and vehicular traffic. Local governments are concerned about the high cost to effect compliance with the PM<sub>10</sub> standard, and the long-term effect of any control measures.

The Department was contacted by the Bethel City Manager's office in 1997-1998 to inquire as to the possibility of performing monitoring. The Department indicated that no funding was available, but that we could probably provide monitors, training and filter weighing if they had an operator. The city was contacted in May 1998 and notified of the availability of EPA grants to small communities. They elected not to participate and indicated that they would try local dust control methods without monitoring.

In 2000 Ben Stevens of the Council of Athabascan Tribal Governments (CATG) contacted the State for assistance in studying the dust exposure from their unpaved roadways. The State assisted by supplying PM<sub>10</sub> samplers, filters, training and laboratory services. There is currently a monitoring site in Stevens Village, and another slated for installation at Fort Yukon. These sites are controlled and operated by village staff.

In 2001 Francis Chin of the Maniilaq Association (Kotzebue) contacted ADEC for assistance in studying particulate matter from numerous sources (primarily wood smoke and road dust). ADEC has supplied technical support, PM<sub>10</sub> samplers, and training. Monitoring is expected to begin at several sites during the 2001 calendar year. These sites will be controlled and operated by local village staff. Mr. Chin has been using IGAP funds and coordinating with other IGAP programs across the State (including Tyonek, Tanana, Eklutna and others) to establish his program.

PM<sub>10</sub> monitors have been set up in Homer to monitor smoke during burning events associated with fuel removal for wildfire protection. Monitoring is also done during the summer forest fire season to assess human health risks from wildfire smoke.

## 2. REVIEW OF MONITORING SCALES

EPA Region 10 requested that ADEC staff provide a table which demonstrates that each monitoring site complies with siting criteria identified in 40 CFR Part 58 Appendix E. Included are two tables: one for CO sites and one for PM sites. Certain sites have been found to have had their monitoring scale mis-designated. A discussion of the monitoring scale changes follows each table.

ADEC staff and site operators (Municipality of Anchorage staff and Fairbanks North Star Borough staff) have not yet chosen a course of action for the reassigned monitoring scales. In simple cases ADEC expects that samplers or inlet probes may be moved to accommodate the desired monitoring scale. In other cases that would be impractical and the decision to remove the site, to move to another site, or to continue operating using the new scale will have to be addressed. No action will be taken without consultation with EPA Region 10 personnel.

### Carbon Monoxide Sites

Carbon monoxide (CO) inlet probes should be at least 1 meter away, both vertically and horizontally, from any supporting structure or wall. For microscale sites the probe height must be between 2.5 and 3.5 meters, whereas for other scale sites the probe must be between 3 and 15 meters high.

A probe must have unrestricted airflow for at least 270 degrees, or 180 degrees if it is located on the side of a building. Obstructions must be a minimum distance away equal to twice distance by which the height of the obstruction exceeds the height of the probe.

Microscale inlet probes must be located between 2 and 10 meters from the nearest traffic lane of the roadway that is being monitored, and must be 10 meters from an intersection (mid-block is preferred). The minimum separation distance between the probe and nearest traffic lane for neighborhood scale sites depends upon the number of vehicles per day (VPD) that use the roadway according to the table below:

<u>Average Daily Traffic (VPD)</u>	<u>Minimum Separation Distance</u>
10,000 or fewer	10 meters
15,000	25
20,000	45
30,000	80
40,000	115
50,000	135
60,000 or more	150

Trees should not be present between the dominant CO source or roadway and the inlet probe.

On the next page is a table of the CO monitoring sites in Alaska (including SPMS) and how they fit the siting criteria from Appendix E of 40 CFR Part 58.

Site Name	Monitoring Scale	Probe Distance from Wall	Height	Spacing from Obstructions	Spacing from Roadway	Trees
Benson and Spenard	Microscale	1 meter	3 meters	270 degrees unobstructed	5 meters	None
Garden	Microscale	1 meter	3 meters	180 degrees unobstructed	7 meters	Yes
Benson and Seward	Microscale	1 meter	3 meters	270 degrees unobstructed	4 meters	None
Turnagain	Neighborhood	1 meter	3 meters	180 degrees unobstructed	12 meters from 500 VPD roadway	Yes
Old Post Office	Microscale	1 meter	3 meters	180 degrees unobstructed	3 meters	None
State Office Building	Microscale	1 meter	3 meters	180 degrees unobstructed	8.5 meters	one 3 meter shrub
Hunter Elementary School	Neighborhood	1 meter	3 meters	180 degrees unobstructed	>30 meters (<10,000 VPD)	none

The Garden site was formerly designated as neighborhood scale, but does not meet the minimum 10 meter separation distance to the nearest traffic lane. The Garden CO inlet probe is now considered to be microscale. The Garden site also has medium sized spruce trees present between the inlet probe and the roadway (see site description in attachments) which is in conflict with the requirements of Appendix E.

The Turnagain site meets the requirements for neighborhood scale, but it has significant spruce trees between the inlet probe and the nearest traffic lane.

The State Office Building site was formerly classified as middle scale, but is within 10 meters of the nearest traffic lane. The State Office Building CO inlet probe is now considered microscale. There is a 3 meter tall deciduous shrub near the State Office Building inlet probe. Its height and that of the probe are similar, and the shrub is leafless during the winter CO season so it is not considered to be an obstacle.

### **Particulate Matter (PM<sub>10</sub> and PM<sub>2.5</sub>) Sites**

Particulate matter inlets must be between 2 and 7 meters from ground level for microscale sites, whereas for other scale sites the probe must be between 2 and 15 meters high.

A sampler must have at least 2 meters separation from walls, parapets, penthouses, etc... A sampler must have unrestricted airflow for at least 270 degrees, or 180 degrees for street canyon sites. Obstructions must be a minimum distance away equal to twice distance by which the height of the obstruction exceeds the height of the sampler inlet.

The sampler inlet should be at least 20 meters, and must be at least 10 meters from the dripline of trees that act as obstructions.

Microscale sampler inlets must be located between 5 and 15 meters from the nearest traffic lane for traffic corridor sites, and between 2 and 10 meters for street canyon sites. The minimum separation distance between the probe and nearest traffic lane for middle, neighborhood, or urban scale sites depends upon the number of vehicles



per day (VPD) that use the roadway according to a rather complicated table in Appendix E of 40 CFR Part 58.

Below is a table of the PM monitoring sites in Alaska (including SPMS) and how they fit the siting criteria from Appendix E of 40 CFR Part 58.

Site Name	Monitoring Scale	Height	Spacing from Obstructions	Spacing from Roadway	Traffic (VPD)	Trees
Garden	Middle	10 meters	12 meters to 5 meter tall penthouse	10 meters	< 5,000	None
Muldoon	Middle	3.5 meters	None	24 meters	32,500	None
Tudor	Microscale	3.3 meters	None	7 meters	46,900	
Parkgate	Neighborhood	6 meters	13 meter to 4 meter tall penthouse	44 meters	11,000	None
Harrison Court	Urban	4 meters	None	150 meters	< 5,000	None
Big Lake	Urban	12 meters	None	> 100 meters	< 5000	None
Denali Park	Regional	5 meters	None	> 100 meters	< 5,000	> 20 meters
State Office Building	Neighborhood	6 meters	30 meters to 3.75 meter tall penthouse	20 meters	2,400	1 tree at 10 meters away
Floyd Dryden	Neighborhood	6 meters	Furnace flue @ 20 meters, 4 meter penthouse @ 15 meters	65 meters	12,770	12 meter tall @ 25 meters away
Lemon Creek	Neighborhood	5 meters	None	55 meters	12,605	7 meters away
Sesame Street	Neighborhood	5 meters	None	on cul-de-sac	20	10 meters away

The Garden PM site is within 15 meters of the nearest roadway, and is therefore can not be considered neighborhood scale. Because it is higher than 7 meters the Garden PM site is now considered middle scale.

The Tudor site is now considered to be microscale.

The Pargate site is now considered to be neighborhood scale.

The Sesame Street site sits on the end of a road that serves a handful of houses. There is virtually no traffic on Sesame Street and ADEC staff therefore considers the site to be neighborhood scale.

## **LONG TERM MONITORING STRATEGY – 2001 TO 2005**

### **Monitoring Network Refinement**

As monitoring dollars become more and more scarce, some sites may have to be discontinued to save the integrity of other sites in the network. The State intends to assess the reported PM<sub>10</sub>, PM<sub>2.5</sub> and CO concentrations in order to eliminate or relocate sites that appear to be redundant or unnecessary. PM<sub>2.5</sub> sites may be kept for three years to meet EPA's fine particulate monitoring data needs.

Alaska also has the unique and costly problem of monitoring in remote Alaskan bush communities, which have seen little effort in the past.

By 2005 the State expects the CO network in Anchorage to decrease to a maximum of three sites, while the Fairbanks network is projected to shrink to two sites. It is the State's intent to minimize the amount of microscale monitoring done in Alaska.

By 2005 the State expects Anchorage and Eagle River to share two to three PM<sub>10</sub> sites and one or two PM<sub>2.5</sub> sites. Juneau and Fairbanks are both expected to have a single PM<sub>2.5</sub> site and no PM<sub>10</sub> sites.

By 2005 the State expects that most PM<sub>10</sub> monitoring in Alaska will be SPM monitoring in rural Alaska and the Matanuska-Susitna Valley.

As the State completes the investigation of fine particulate impacts in the major cities, our focus will switch to looking at more rural areas and small communities such as Sitka, Skagway, Bethel, and Nome.

### **PM<sub>2.5</sub> Speciation Monitoring**

ADEC staff will acquire and install a PM<sub>2.5</sub> speciation sampler at a neighborhood scale monitoring site in Anchorage by the end of calendar year 2001. It appears likely that no sites in Alaska will be designated as non-attainment for PM<sub>2.5</sub>, and therefore Anchorage was selected since it is the community with the greatest population (the residents of Anchorage make up approximately half the population of the entire state). A specific site has not yet been definitely determined.

It is the intention of ADEC that the sampler be operated for a minimum of two years at that site. After that time an evaluation of the data (the speciation data as well as PM<sub>2.5</sub> mass data from the rest of the State network) will determine whether the sampler remains operating at that site or if it is relocated to a new site, whichever provides data of greater usefulness.

## PROPOSED CHANGES TO THE NETWORK

### Ketchikan Sesame Street PM<sub>2.5</sub> Site

This SPMS sampler has now been operated at that site for four consecutive winter quarters (4<sup>th</sup> quarter 1999, 1<sup>st</sup> and 4<sup>th</sup> quarters 2000, as well as 1<sup>st</sup> quarter 2001). The data summary for this site for each of the two years of operation shows the following:

Year	Average	Maximum	2 <sup>nd</sup> Max
1999 4 <sup>th</sup> qtr	3.25 µg/m <sup>3</sup>	7.3 µg/m <sup>3</sup>	5.1 µg/m <sup>3</sup>
2000 1 <sup>st</sup> & 4 <sup>th</sup>	5.17	32.2	22.4
2001 1 <sup>st</sup>	5.04	22.8	12.7

These values are less than half of either the 24-hour and annual NAAQS. This site was intended to operate for one year (winter 1999-2000) and then an assessment would be made as to the value of relocating versus keeping it there for another year. During the summer of 2000 the decision was made to leave the monitors in place for another winter.

ADEC staff feels that there is little reason to continue expending resources operating this site. The samplers that have been operated at this site have been redeployed to support another urgent monitoring project. ADEC entered into a joint agreement with the cruise ship industry and the city of Juneau to monitor emissions from cruise ships for one year. When these samplers are again available ADEC would like to relocate them to another monitoring site in another southeast Alaska community.

### Juneau Lemon Creek PM<sub>2.5</sub> site

The Lemon Creek SPMS site has been operating since late 1999. The owner of the property would like for ADEC to remove the site from its current location.



Figure 3 – Aerial photograph of the Lemon Creek Valley.

The concentrations measured at the Lemon Creek site are significantly below both the annual and the 24-hour NAAQS. In two years of every third day sampling, only four values exceed 20  $\mu\text{g}/\text{m}^3$ . A summary of mean, maximum, and second maximum  $\text{PM}_{2.5}$  concentrations are given below:

Year	Average	Maximum	2 <sup>nd</sup> Max	3 <sup>rd</sup> Max
1999	4.25 $\mu\text{g}/\text{m}^3$	5.8 $\mu\text{g}/\text{m}^3$	2.7 $\mu\text{g}/\text{m}^3$	1.0 $\mu\text{g}/\text{m}^3$
2000	5.40	28.2	26.5	19.6
2001	7.12	33.5	32.8	13.2

Sources in this location include vehicle traffic, wood and fuel combustion for home heating, a gravel pit, and incinerator, and an asphalt plant. The principal  $\text{PM}_{2.5}$  impact on the populace of the Lemon Creek Valley is automobiles and home heating since the industrial sources (except for the gravel pit) have tall enough stacks to loft emissions far above breathing height. The gravel pit produces predominantly  $\text{PM}_{10}$ .

In general meteorological conditions do not appear to be likely to cause sporadic extremely high particulate matter concentrations. Temperatures very rarely get below 0 °F and inversion strengths do not compare with those of Alaska's interior. Furthermore the Lemon Creek Valley is windy enough for good dispersion.

ADEC doesn't feel that it would be valuable to relocate the  $\text{PM}_{2.5}$  samplers to another site in the Lemon Creek Valley, and instead would prefer to establish a new  $\text{PM}_{10}$  deeper in the valley (nearer the gravel pit) and redeploy the  $\text{PM}_{2.5}$  monitors to a new site at one of the following:

1. Another South East Alaskan Community, or
2. Another community in Interior Alaska, or
3. Downtown Juneau.

### **Benson and Spenard CO Site**

This SLAMS site is very similar to the Benson and Seward SPMS site. The two sites sit approximately one mile apart on Benson Boulevard, and both are at busy intersections (Benson and Seward is the busier intersection). Both are microscale traffic corridor sites. The State of Alaska feels that the Benson and Spenard site, while older and designated SLAMS, is redundant to the newer Benson and Seward site.

Below is a chart (Figure 4, next page) of the maximum and second maximum 8-hour average CO concentrations for the last 10 complete monitoring years. The Benson and Seward site has higher measured CO concentrations virtually every year. Of these two similar sites the Benson and Seward site is the more valuable.

Anchorage has four CO monitors currently. The other two sites are in residential areas that are considered to be maximum concentration locations. The State and Municipality of Anchorage would like to move this monitor to an alternate site or else to decrease the size of the network.

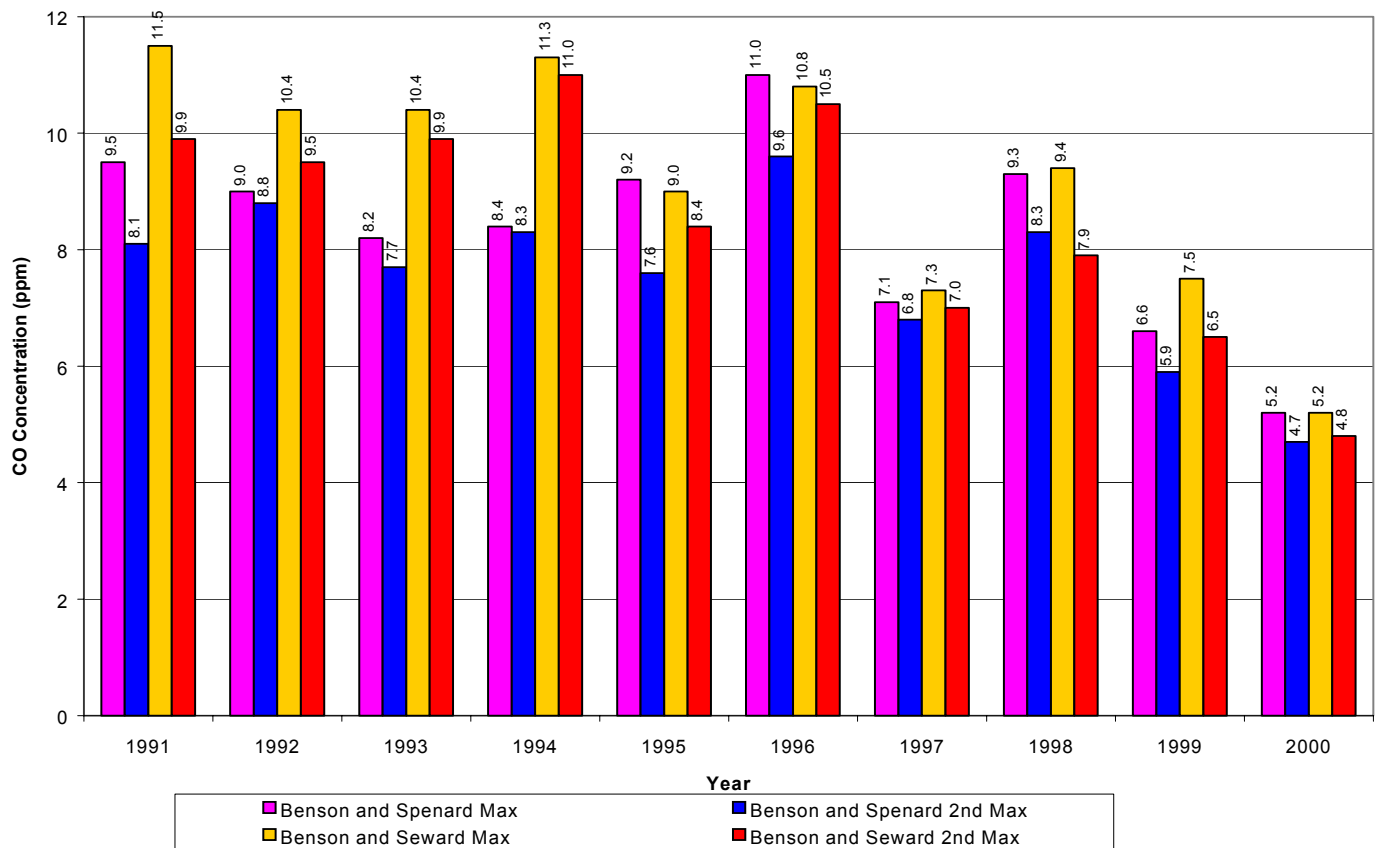


Figure 4 – Bar chart showing maxima and second maxima of Benson and Spenard and Benson and Seward CO monitoring sites for the calendar years 1991-2000.

## **DESIGNATING NAMS MONITORING SITES**

### **Previous NAMS Sites**

There had been a PM<sub>10</sub> NAMS monitor at the Gambell site [02-020-0026] in Anchorage, but that site was removed when the building was demolished in 1999.

Gambell had been adjacent to a major roadway (a microscale site) and wasn't appropriate for NAMS designation according to Appendix D to 40 CFR part 58. No steps have been taken to designate a replacement.

### **Alaskan Cities**

The largest metropolitan statistical area (MSA) in Alaska is the Municipality of Anchorage. Anchorage has a population of 260,283<sup>1</sup>. The population of Anchorage makes it marginally eligible for requiring a PM<sub>10</sub> monitoring site with NAMS designation.

The community with the next highest population is the Fairbanks North Star Borough, which is not in an MSA. Fairbanks has 82,840 people<sup>1</sup> and an area of 7,366 square miles. The city of Fairbanks has 30,224 people<sup>1</sup>. Fairbanks is too small for a NAMS-designated monitor.

There are no other communities within Alaska that come close to qualifying for NAMS designation.

### **Carbon Monoxide Sites**

According to 40 CFR Part 58 Appendix D, cities (urbanized areas) need to have populations over 500,000 to require NAMS designation. Alaska has no such areas, and therefore NAMS designation is not recommended for any monitoring sites in the state.

The justification given in Appendix D states that large population urban areas provide sufficient data for national analysis and national reporting. While Alaska has significant concentrations of CO in both Anchorage and Fairbanks, ADEC feels that there is nothing to change designation from SLAMS.

### **Particulate Matter (PM<sub>10</sub>) Sites**

Table 4 in Appendix D of 40 CFR Part 58 has a lower cutoff point of populations greater than 100,000 persons. Alaska has only one community with more than 100,000. The Municipality of Anchorage (population 260,283) is in a category where NAMS designation may be appropriate.

The population number is deceptive since the Municipality includes outlying communities that are geographically isolated from the city of Anchorage such as Girdwood, Chugiak, Peter's Creek, and Eagle River. These outlier communities represent over 30,000 persons, which means that the true population of the city of Anchorage is below 250,000 (closer to 230,000).

In the last three complete calendar years Anchorage has not exceeded 80% of the NAAQS at any site. The highest 24-hour average concentration of PM<sub>10</sub> was measured at a microscale site (Gambell, which is now defunct) in 1998 at 115 µg/m<sup>3</sup> (76.7% of the NAAQS). The highest annual average concentration of PM<sub>10</sub> was measured at the same

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<sup>1</sup> according to the 2000 U. S. Census

microscale site in 1999 at  $30.2 \mu\text{g}/\text{m}^3$  (60.4% of the NAAQS). In 2001 a high wind event caused the NAAQS to be exceeded one time, but it is being handled as a natural event.

The number of NAMS monitoring sites is established based on the population and the ambient  $\text{PM}_{10}$  concentrations. For low concentration sites (less than 80% of the NAAQS) 0-1 site are called for in cities over 250,000 people. For cities under 250,000 Appendix D requires no NAMS designated monitoring sites. Since the city of Anchorage does not fall into the 250,000+ population category, ADEC proposes not designating any sites as NAMS for  $\text{PM}_{10}$ .

#### **Particulate Matter ( $\text{PM}_{2.5}$ ) Sites**

The NAMS designation guidance in Appendix D is unclear. It appears that 10-15 sites will be designated NAMS for  $\text{PM}_{2.5}$  for the entire EPA Region 10. Of those 1-3 will be selected with the primary objective of monitoring regional transport. Further discussion will have to take place between ADEC and EPA Region 10 to determine what criteria will be used to designate NAMS sites.

If an Alaskan site is to be designated as NAMS, it will most likely be in Anchorage. Of the two sites in Anchorage Garden [02-020-0018] is neighborhood scale and Tudor [02-020-0044] is middle scale. The Garden site seems to more closely fit the desired monitoring scale in Appendix D.



**PM<sub>2.5</sub> Monitoring Network**

Site Name	Location	AIRS ID	Designation	Site Type	Scale	Install Date	Frequency	Collocated	Instrument	Notes
Garden	Anchorage	02-020-0018	SLAMS	CORE	middle	Nov, 1998	1 in 3 <sup>†</sup>	yes	Partisol 2000	
Tudor	Anchorage	02-020-0044	SLAMS	non-CORE	microscale	Jan, 1999	1 in 3	no	Partisol 2000	
State Office Bldg.	Fairbanks	02-090-0010	SLAMS	CORE	neighborhood	Oct, 1998	1 in 3	yes	Partisol 2000	
Floyd Dryden	Juneau	02-110-0004	SLAMS	CORE	neighborhood	Nov, 1998	1 in 3	yes	Partisol 2000	
Lemon Creek	Juneau	02-110-0026	SPMS	optional	neighborhood	Dec, 1999	1 in 3	no	Partisol 2000	
Sesame Street	Ketchikan	02-130-0008	SPMS	CORE	neighborhood	Oct, 1999	1 in 3	no	Partisol 2000	seasonally operated (winter)
Big Lake	Big Lake	02-170-0004	SLAMS	Transport	urban	Mar, 2000	1 in 3	no	Partisol 2000	
Butte	Butte	02-170-0008	SLAMS	CORE	urban	Dec, 1998	1 in 3 <sup>†</sup>	no	Partisol 2000	
Denali	Denali Park	02-290-0003	SLAMS	Background	regional	Apr, 2000	1 in 3	no	Partisol 2000	

**PM<sub>10</sub> Monitoring Network**

Site Name	Location	AIRS ID	Designation	Install Date	Scale	Frequency	Collocated	Instrument	Notes
Garden	Anchorage	02-020-0018	SPMS	Nov, 1998	middle	1 in 6 <sup>†</sup>	no	GMW 1200	
Muldoon	Anchorage	02-020-0043	SPMS	Apr, 1995	middle	1 in 2	no	GMW 1200	seasonally operated (winter)
Tudor	Anchorage	02-020-0044	SPMS	Oct, 1996	microscale	1 in 2	yes	GMW 1200	
Parkgate	Eagle River	02-020-1004	SLAMS	Oct, 1987	neighborhood	1 in 6	no	GMW 1200	
Floyd Dryden	Juneau	02-110-0004	SLAMS	Jan, 1986	neighborhood	1 in 3 <sup>†</sup>	yes	GMW 1200	frequency to be reduced to 1 in 6
Butte	Butte	02-170-0008	SPMS	Apr, 1998	urban	1 in 3 <sup>†</sup>	no	GMW 1200	

**CO Monitoring Network**

Site Name	Location	AIRS ID	Designation	Install Date	Scale	Operates	Instrument	Notes
Benson & Spenard	Anchorage	02-020-0017	SLAMS	Jan, 1978	micro	Oct – Mar	TECO 48	
Garden	Anchorage	02-020-0018	SLAMS	Jan, 1979	micro	Oct – Mar	TECO 48	
Benson & Seward	Anchorage	02-020-0037	SPMS	Oct, 1987	micro	Oct – Mar	TECO 48	
Turnagain St	Anchorage	02-020-0048	SPMS	Oct, 1998	neighborhood	Oct – Mar	TECO 48	
Old Post Office	Fairbanks	02-090-0002	SLAMS	Jan, 1972	micro	Oct – Mar	Dasibi 3008	
State Office Bldg.	Fairbanks	02-090-0013	SLAMS	Jan, 1972	micro	Oct – Mar	Monitor Labs 8830	
Hunter Elementary	Fairbanks	02-090-0020	SLAMS	Jan, 1979	neighborhood	Oct – Mar	Monitor Labs 8830	

**Monitors Terminated in 2000**

Site Name	Location	AIRS ID	Designation	Parameter	Scale	Termination Date	Notes
Ocean View	Anchorage	02-020-0042	SLAMS	PM <sub>10</sub>	neighborhood	Mar, 2000	
State Office Bldg.	Fairbanks	02-090-0010	SLAMS	PM <sub>10</sub>	neighborhood	Jul, 2000	

<sup>†</sup> There is also a continuous PM monitor operating at this site.